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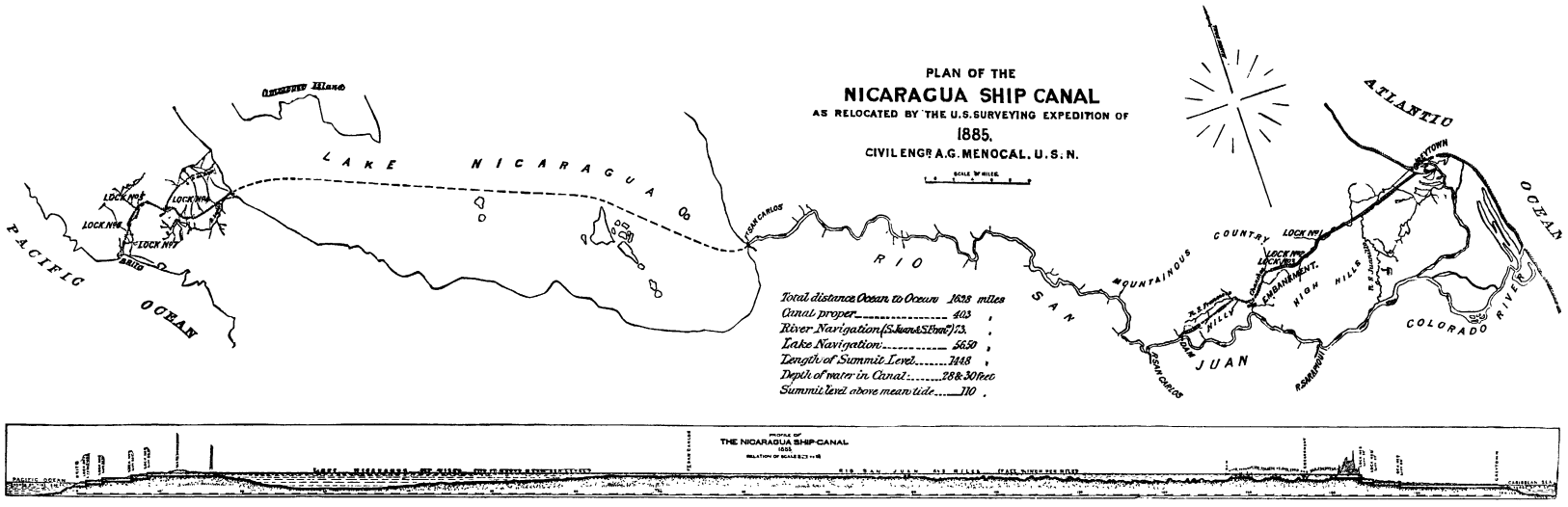
In preparing the following paper, I have made free use of the excellent work of Lieutenant Sullivan, U. S. Navy, on interoceanic transit, from which I have obtained much valuable information. I wish also to acknowledge my indebtedness to the interesting works of Mr. Rodrigues on the Panama Canal, of Professor Nourse, U. S. N., on the Suez Canal, and to the pamphlets of Captain Eads and Mr. Corthell on the Tehuantepec ship railway. I have received also valuable information from the officials of the Panama Railroad and the Panama Canal works in examining the progress of the canal construction, and from the officials of Nicaragua and Costa Rica in my brief visits to those republics.

My thanks are especially due to Rear-Admiral Ammen and Civil Engineer Menocal, U. S. Navy. To the knowledge and ability of these gentlemen, and to their patriotic zeal, America will some day be largely indebted for the existence of a Nicaragua Canal.

H. C. Taylor,
Commander, U. S. Navy.


PLAN OF THE
NICARAGUA SHIP CANAL
AS RELOCATED BY THE U.S. SURVEYING EXPEDITION OF
1885.
CIVIL ENGR A.G. MENOCAL, U.S.N.
SCALE 30 MILES
Total distance Ocean to Ocean 183.5 miles
Canal proper 103 "
River Navigation (S. Juan & Sarapiqui) 73. "
Lake Navigation 56.50 "
Length of Summit Level 14.48 "
Depth of water in Canal 28 & 30 feet
Summit Level above mean tide 110 "
PACIFIC OCEAN
ATLANTIC OCEAN
LAKE NICARAGUA
RIO SAN JUAN
COLORADO RIVER
SAN CARLOS
GREYTOWN
LOCK No 1
LOCK No 2
LOCK No 3
LOCK No 4
LOCK No 5
LOCK No 6
LOCK No 7
EMBANKMENT
HIGH HILLS
MOUNTAINOUS COUNTRY
HILLY
PROFILE OF
THE NICARAGUA SHIP-CANAL
1885

THE NICARAGUA CANAL.

Ladies and Gentlemen:

In speaking to you to-night concerning the problem of connecting the oceans, it may be well to say in advance that I am a firm believer in a canal by way of Lake Nicaragua. I will add, however, that I have been brought to that belief by no interest in one route over another, but by unprejudiced study of all the routes for many years, and by some personal observation and experience.

We will consider principally three localities and methods by which the oceans may be joined: Panama, a sea-level canal; Nicaragua, a canal with locks; Tehuantepec, a ship railway.

Upon these three routes the interest of the world's commerce has centred. There have been others—some of them with ardent advocates,—and a slight notice of them may do something to clear the ground before we come to a more detailed consideration of these three principal lines.

The search for a practicable canal route succeeded to the long persistent examination which had caused explorers for so many years to penetrate every inlet from Newfoundland to La Plata, in the hope of finding the strait which they confidently believed nature had provided as a means of communication between the oceans.

"Men," said Humboldt, "could not accustom them-

selves to the idea that the continent extended uninterruptedly from such high northern to such high southern latitudes." From the year (1513) when Nuñez de Balboa first looked upon the wide sweep of the Pacific, a century was occupied in fruitless efforts of gallant and capable men to discover that strait which nature should have placed there—but did not.

The Cabots worked in the north. D'Avila, under secret orders of the Spanish king, scrutinized eagerly the isthmuses and the Spanish main; while De Solis, under similar instructions, explored the coast of Brazil, and while hopefully ascending the great estuary of La Plata, was killed by the natives of that region. Ponce de Leon sailed hundreds of miles northward from Panama on the same errand; Cabrillo and other lieutenants of Cortez groped north and west from Tehuantepec, as far as the vicinity of the present Monterey and San Francisco; and Cortez himself under the urging of his royal master, King Charles V. of Spain, struggled against much obstacle and disaster to achieve the desired discovery. When, however, the Gulf of California was found to have a head at the mouth of a great continental river, the intelligent Spanish explorers, already doubtful, could no longer believe in the existence of any communication between the seas, and the "secret of the strait" faded away into the dreamland of legend and fable. Other nations than Spain still hoped. As late as 1607, we are told by Bancroft, Virginia colonists were ordered to seek communication with the South Sea "by ascending some stream which flowed from the northwest," and that it was in ascending the Chickahominy with this end in view, that Captain John Smith was captured by the natives; and thus another touch of in-

terest is added to the adventurous record of this man of ordinary name and extraordinary life.

The strait was indeed an idea difficult to surrender. It *ought* to be true, they said. The seas are so close together for a thousand miles. Commerce between "Cadiz and Cathay" so greatly needs it. It *must* be so. That it should not be, was, in the words of the writers of that day, "repugnant to the interest of humanity." The "secret of the strait" *must* be disclosed.

Not alone in history are these ardent enthusiasts. In every age some will be found. In our own day we have seen two men of brilliant parts gazing upon the map of Central America with the eyes of conquerors. The one saying "I perceive how useful to commerce would be a canal at Panama. Therefore nature must have intended one. Therefore, nature *did* intend one and I will dig one. And now, *that* being *decided*, I will enquire as to *how much digging* there may have to be done," what mountains to remove, what torrents to control. Another, also with map on knee, says: "I perceive the commerce of the Mississippi, issuing into the Gulf of Mexico, opposite the Coatzacoalcos River and the Isthmus of Tehuantepec. How natural and simple to traverse the Gulf, and crossing the Isthmus, to proceed to our Pacific States. Nature clearly contemplated this location for a transit route. I will utilize it. And now, with *that settled*, let us see what obstacles to remove, what serious difficulties to surmount. Let us see whether in fact nature did contemplate this location as a transit route." As in that former time, these gentlemen know what nature ought to have done, and therefore know she has done it. How much this false knowledge of the one has cost the people of France can now be ap-

proximately estimated. We have yet to learn at what cost the people of the United States will acquire the same valuable though bitter experience.

The world moving, like all large bodies, slowly toward conviction, did become at last convinced that nature had not pierced the barrier for our use and comfort, and this conviction once forced upon it, plans for an artificial channel began soon to be suggested. The idea had been touched upon by Balboa, Cortez, and Saavedra, but the first record we have of a practical suggestion is that of the Spaniard Gomara, who urged the idea upon Philip II. in 1551,—but the son was not the father; nor were such leaders as Cortez to be found, even had the spirit of Charles V. still animated the actions of the Spanish throne.

From this time forward, the Spanish government seemed disposed rather to smother than to encourage any efforts to connect the oceans. As the old-time Spanish vigor departed, the feeling grew that if any good route were found, it would only be snatched from them by some of those daring Drakes and Grenvilles, who, roaming the seas at the head of brave and reckless companies, sought every opportunity to insult Spain and plunder its colonies.

A long period now passed, during which no interest was evinced in the canal question. The mystery with which the Spanish government had wished to cover it was complete. If the desire for knowledge came later, the failing vigor of that nation stood in the way of any successful investigation.

It was left for Humboldt to reawaken an interest among the nations, and to indicate localities where favorable results would be most likely to be met with by the explorer

and surveyor. In his opinion, the valley of the Atrato and the Isthmus of Darien were points where examinations should first be made. Later we shall see how thoroughly these localities have been surveyed, and with how little success.

In 1825 Nicaragua invited the co-operation of the United States in the construction of a canal by way of Lake Nicaragua and the river San Juan, but with no satisfactory results. In the same year Mexico caused a rough survey to be made of the line *via* the Coatzacoalcos River and the Isthmus of Tehuantepec, resulting in an official report that the "canalization of this isthmus was problematical and gigantic."

Later, in 1828–29, a survey was made under orders from General Bolivar of a route substantially the same as that of the present railway between Aspinwall and Panama. Nothing was effected by this action, except to put an end to the popular error that the mean levels of the oceans on opposite sides of the isthmus differed appreciably. There are still some, I believe, among those who have not given their attention to this subject, who are yet ignorant that differences are caused only by tides, winds, barometic pressures, and other temporary disturbing causes, and that the levels of the two seas may be regarded as practically the same.

Many other attempts were made in the ensuing years, and with uniform lack of success. In 1830 the Netherlands, beginning fairly enough, were obliged by the revolution in Belgium and its separation from Holland to give up the project. In 1835 President Jackson appointed Mr. Charles Biddle as special agent to promote the idea of an isthmus canal, and to visit the Central American

countries for that purpose. Mr. Biddle met with many difficulties, and returned to the United States with nothing accomplished of value, and from this time the projects became too numerous to be even touched upon in a paper of this scope. M. Guizot, under Louis Philippe, urges interoceanic canal questions upon the attention of the Chamber of Deputies. A bishop of San Salvador goes to Rome and urges the importance of a canal upon the Pope. All of no avail; but in 1849 a success is scored, not for a canal, but for the Panama Railway.

This method of transit, of vast service to commerce, has, however, by providing an imperfect system, retarded the realization of that dream, long cherished, of a water connection between the oceans.

We must now, having glanced briefly at the past history of this great problem, make a rapid review of the work of to-day, and consider the various routes which have been examined during the last few years. Although the boiling-down process of precise instrumental surveys has reduced these possible lines of transit to three, Panama, Nicaragua, and Tehuantepec, and although the further boiling-down process of actual digging and building will, it is believed, soon rule out Panama and Tehuantepec, leaving only Nicaragua, yet many other routes, methods, and plans have been examined, and no portion of the isthmuses can be said to have been neglected.

Beginning at the south, we find the Atrato River, recommended by the great Humboldt, rising in the mountains of Western Columbia, and pursuing a northerly course to its mouth in the southwestern corner of the Caribbean. Although its waters empty into the Eastern Sea, its course is parallel to the Pacific coast, and only

about fifty miles from that ocean. The main stem of the Andes, whose eastern slopes it drains, separates it throughout its course from the Pacific. This range is throughout this portion not of great elevation, and numerous tributaries afford, in their valleys, easy grades from the Atrato to or toward the crest of the divide.

Humboldt was told of vessels passing from the headwaters of the Atrato to those of a small stream flowing southwest into the Pacific,—by means of a short canal. Later examinations show that the vessels were canoes, the canal, if not mythical, was a ditch, and that a long and high portage intervened over which the canoes were dragged. Lower down the Atrato several lines of levels were run across the divide with much care and labor, following the lines of some of the principal tributary streams entering from the westward. In these it was found necessary that the summit levels should include tunnels many miles in extent, high enough to accommodate ships with at least the lower masts left standing, and involving enormous expense. Attempts were also made to connect the Gulf of San Miguel with Caledonia Bay on the Caribbean side; and at a point farther west, to connect the Gulf of San Blas on the Caribbean with the Bayano River, emptying into the head of Panama Bay. Here again long tunnels or other formidable obstacles were soon revealed as the lines of levels were carried across.

Next came the line of the Panama Railroad, and here high hopes were entertained, for a railroad was already there, and the Chagres, a large stream, debouching near Aspinwall, has its source well over toward the Panama or Pacific side of the isthmus. After careful surveys on this line it was decided that a lock canal was possible, though

difficult, costing over a hundred millions, and meeting with some trouble in supplying water for its summit level. A canal at the level of the sea was deemed impracticable, it being considered that the violence of the freshets in the Chagres placed it beyond successful engineering control.

The surveys of these routes had been carried on by our government, but the interest felt to-day in the Panama Canal project makes it proper for me to notice other work in that locality, for French enterprise had begun to stir, and a speculative company, known as the "International Society of the Interoceanic Canal," was formed in Paris in 1876. It sent out an officer, of the French Navy, with instructions to search for the best line for a canal within certain boundaries named in his orders. These boundaries were the limits of certain territory in which the society had reason to know they could obtain a concession of land for canal purposes. From the sale of this concession the society hoped for much profit, but was not specially interested in the final success of a great canal company, if first that company should have purchased from their society, at a sufficiently large price, the desired concession. This was not a good beginning, but the instructions to this expedition were submitted to M. de Lesseps, and approved by him.

The individuals comprising this expedition proved to be, in all save engineering qualities, vigorous and enterprising persons. They ran some lines of levels, glanced at some other routes, guessed at the heights of many hills, and at the possible volumes of many streams in time of freshet. On the basis of these data, however, they did not hesitate to make the most elaborate plans and estimates, including minute details.

The real and valuable work done, valuable to the speculators, at least, was shown, however, when they returned to France in 1878, bearing with them a concession, obtained at the capital Bogota, and embracing all routes comprised within the limits of the United States of Colombia. It seemed to matter little to the gentlemen of Paris that no practicable line existed throughout their concession; that their most able engineer, M. Celler, in despair of finding any route for a sea-level canal, had submitted plans for a canal with locks, while admitting that he had but meagre data for it, because he had been sent out to find only a sea-level canal. These mischances affected but little the speculative minds of the International Interoceanic Company. They had obtained their concession; they had, by means known to themselves, persuaded that illustrious Frenchman, whose fame gained at Suez made his name a symbol and surety of success, to cast in his fortunes with them. There was left them only to use that name to form a great Canal Construction Company, which should purchase from them, at a great price, the concession they had obtained from Colombia for a song.

To do this no time was lost. An international conference was held at Paris, under the auspices of the Paris Geographical Society, in May, 1879, for the purpose of deciding upon the best locality for an interoceanic canal.

It is difficult to describe with coolness the methods of this conference.

With seventy-four French members devoted to de Lesseps' interests and ideas, and but sixty-two of other nations; with a "technical" committee and sub-committees crowded with Suez Canal engineers, with a programme specially

arranged to prevent general discussion,—with these precautions it is not surprising that, amid the sturdy protests of such world-famous engineers as Sir John Hawkshaw, of such special experts as Admiral Ammen and Engineer Menocal, the conference should vote with enthusiasm for a sea-level canal between Aspinwall and Panama.

The conference ended, a great company was soon formed; and de Lesseps at its head, by his reputation and his marvellous energy, soon had the needed millions at his disposal, and began the work which we are now watching to-day.

As to its progress: The expenditures are represented by something over one hundred and fifty millions of dollars; while M. de Lesseps claims from twelve to fourteen per cent. of the excavation completed, and unprejudiced engineers claim only six to eight per cent. completed. He holds that the time already occupied, five years, has been so well spent in preparation, that three years more will complete the work. Neutral parties of intelligence announce that it will be impossible to complete it before the year 1900, even under most favorable circumstances. But the circumstances cannot be favorable. The charges of interest upon money already spent will be an unceasing drain upon money yet to be received. Torrential rains must continue to fall during the rainy seasons. The problem of the unruly Chagres remains yet unsolved.

We cannot doubt the brilliancy of de Lesseps' vigorous intellect. His long career vouches for it. But Napoleon was brilliant, and yet committed the foolishness of invading Russia. He was great, but he had his Waterloo. De Lesseps is great, but he has his Panama.

Let us pass now to the north and west, to a locality where nature seems to have made, if not a perfect site, at

least a disposition of land and water more favorable than at any other point, for a water transit between the oceans. Here the backbone of the continents and isthmus, running parallel and close to the Pacific shore, sinks to its lowest point, while its eastern slope is washed by that great sheet of inland sea known as Lake Nicaragua. At this low point the divide is less than fifty feet above the level of the lake, and about one hundred and fifty feet above the mean level of the Pacific. Though the western shore of the lake is but fifteen miles from the beach of the Pacific, the lake drains through the River San Juan, into the Caribbean Sea. The lake is deep and unobstructed, and the river, already navigable for light-draught steamers throughout most of its length, requires but a little labor to deepen it.

Here, with such a vast water supply at the summit, with the lake itself as a summit level, nature seems indeed to have offered assistance in connecting the oceans. No great engineering difficulties in utilizing the lake are claimed even by opponents of this route. There are no startling propositions connected with the plan. A large dam is to be built in the river San Juan, to back the water in the river up to the lake, but it is a simple matter of known engineering methods. A lock of exceptional lift is to drop the canal at the west end of the summit level a distance of fifty-two feet. The dimensions and strengths of the parts of this great construction must, therefore, be specially arranged to withstand great strains, but if objection is made to its size it is quite a simple matter to distribute this descent among two or three locks instead of one large one.

It is not to be expected that estimates can be very

exact in a great scheme of proposed work, but about these plans there is nothing new or strange. We have here a minimum of unknown quantities. The estimate is about $50,000,000, and $75,000,000 is proposed for capital, but if it cost $200,000,000, we have a tonnage in the beginning which will pay six per cent. upon the investment, and the tonnage will increase largely. There can be no doubt that besides the ships now needing the canal, a great additional commerce will be created by the existence of such transit.

The scope of this paper will not permit much discussion of detail, but new advantages appear at each examination of this route. In the act of constructing the canal we are, at the same time, harnessing and making subservient to our needs a water power of enormous capacity; supply continuous and inexhaustible, with a head of 110 feet of elevation. And this at a point where the products of the world, the raw materials and the manufactured, meet in their passages between Alaska, California, China, Australia, Peru, and Chili on the one hand, and Europe, Africa, and the United States on the other. At a point, too, where the salubrity of the climate, and the fertility of the surrounding country, will give favorable chances to great undertakings.

What vast opportunities are here disclosed! What an *entrepôt* for the coffee and sugar of Costa Rica and Nicaragua, the guano of Peru, the lumber of Alaska, the grain of California, meeting the cotton of our South, the manufactures of the United States and Europe! What factories, mills, ship-building industries may we not see in the near future along the line of the canal and upon the great lake itself!

The mind grows weary in reviewing the long array of possibilities which nature, in its kindest mood, has placed in this favored spot for the use of man.

Referring briefly to the lines in Costa Rica and Honduras, the former connecting Chiriqui Lagoon with the Gulf of Dulce, and the latter crossing from the Bay of Honduras to the Bay of Fonseca, they may be summed up by stating that excellent locations for railways were found here, with good harbors at the termini, but that the elevation of the mountain range in this vicinity made canals impossible.

Passing on still farther to the north and west, we come to the last of the isthmuses, that of Tehuantepec.

Cortez satisfied himself with regard to its usefulness as a land transit, and sent by that line much of the equipment arriving from Europe for his Pacific fleets fitting out for exploration and conquest. Later on, when no longer used, the world fell again into ignorance concerning it, and the ancient legends of a strait existing here gained a fresh credence until as late as the middle of the last century. In our own time, the scramble to get to California in 1849 caused it to be used once more, and to the routes known as "around the Horn," "across the Isthmus," "over the Plains," was added this one under the name of "through Mexico."

This route demands at my hands something more than a passing notice, for in our present Congress vigorous efforts are being made by Captain Eads to obtain government assistance for a project to carry ships from ocean to ocean across Tehuantepec, upon a railway. Resting his claims for notice, as does the eminent Frenchman, upon past services of unquestioned merit, Captain Eads ad-

vances, as the crown of his engineering career, a scheme which on its face is of doubtful practicability, and which, if proved practicable by the expenditure of vast amounts of money, labor, and ingenuity, can still be shown to be wholly unnecessary. He proposes, as a canal here is impossible, to take sea-going ships, loaded with heavy cargoes, out of the water, lift them upon a cradle, and carry them by rail across 650 feet of elevation, through swamps and across streams, and finally to lower them into the water on the other side of the isthmus.

The mass of engineering opinion regards the building of embankments, the management of grades and turnings, to be, under this heavy load, difficult and dangerous—perhaps impossible. The mass of nautical opinion considers the lifting and carrying of heavy ships, loaded with railroad iron or other heavy weights, to be dangerous in the highest degree to the integrity and safety of the ships' hulls. This gentleman, though, is able, and possesses an ingenious mind. Perhaps he can, at enormous expense, carry out his plan. But why does he wish to do it? Simply to avoid the breaking of bulk—the discharging cargo and loading cars, the discharging cars and stowing cargo—the two handlings of freight, in fine.

There is more than one way of avoiding this breaking of bulk easier and simpler than that he proposes. Ships for this isthmus trade can be easily fitted with interior decks on which rails are laid for cars of the lightest and snuggest construction, stowing closely together, and losing but little stowage room by their interstitial spaces. Cargo may be stowed in them, and these cars, of a size to fit a narrow-gauge road across the isthmus, can be hauled out through the bow or stern ports, in a dock arranged to float

the ship higher or lower, as needed, in order to bring its decks in succession at the level of the shore tracks.

These cars would be run across a cheaply constructed narrow-gauge railway, and run into the hold of a ship on the other side of the isthmus, fitted in the same way to receive them.

Some little stowage space would, of course, be lost, but this loss would be slight compared with the enormous tolls each vessel would have to pay to allow dividends on the expensive railway needed to carry bodily a large vessel and her cargo.

I do not claim that this is a specially good project; but only that it is one of many plans which are more feasible, economical, and sensible than Captain Eads' present scheme.

These remarks, to which you have kindly listened, will have shown you that only three localities have been considered as worthy of being tried: Panama, Nicaragua, and Tehuantepec. You will also have discovered that some persons, myself among the number, believe Nicaragua the only route for efficiency and economy. Did nature, however, offer opportunities for constructing canals at each of these localities, they would all be more or less favorable for the use of commerce, compared with the long and expensive voyage around the Cape of Good Hope or the Horn. Tehuantepec, could it be used, would best serve the coastwise traffic which would be established between the Gulf of Mexico and our Pacific States. For all other traffic of this country and other maritime nations, the more southern routes would be preferable, and between the two, Panama and Nicaragua, Panama would be avoided by a large proportion of the traffic,

namely, the sailing ships, owing to the continuous calms which prevail for hundreds of miles to seaward from that port. The estimate of the amount of tonnage passing through the Nicaragua canal when first opened, was about four millions of tons per year. This estimate, the mean of several reliable calculations by eminent experts, was based upon the figures of the world's shipping trade in 1870. It may now, with justice, be raised to five millions of tons. Upon this tonnage, at a rate of $2.50 per ton, which is about the rate of toll through the Suez Canal, $12,500,000 would be the gross annual revenue. In the estimates for a Nicaragua Canal, $500,000 has been allowed for the working expenses annually, and this would leave a net revenue of $12,000,000 with which to pay the interest upon the cost of construction. What that cost will be is known quite closely in the case of Nicaragua. Work would not be started here in the ignorance which marked de Lesseps' beginning at Panama. Careful instrumental surveys have been made, borings have been sunk, both by land and water, to learn the quality of the cube to be excavated, and where obstacles have prevented exact knowledge, the cubes have been estimated for as solid rock. The estimate for a canal at Nicaragua, larger than that at Suez, is about $50,000,000, and to this 50 per cent. has been added for all contingencies, making $75,000,000.

Though many able engineers believe that it can be built for much less, I believe that sum will represent very closely its total cost. What Captain Eads' project of a ship railway will cost, no one seems to know. His idea is so problematic that no reliable estimate can be formed. Seventy-five millions is mentioned by Captain Eads.

Careful surveys will no doubt make the estimate much greater, especially when we consider the costly equipment needed to carry its heavy burdens. But if it costs only as much as the Nicaragua Canal, it is to be remembered that the working expense of railroads is over fifty per cent. of their gross revenues, and of such an abnormal railroad as this is they would probably be much greater. If these twelve and a half millions represented the total revenues, from four to five millions is as much as could be expected for net revenues from a ship railway. Now judging by the small percentage of gross receipts needed for the working expenses of the Suez Canal, embarrassed by the drifting sands and burdened by a costly home administration, we may reasonably expect a half million of dollars to cover the annual working expenses of a completed Nicaraguan canal, leaving a net revenue of twelve millions, or sixteen per cent. on the cost of construction.

Of the final cost of de Lesseps' sea-level canal at Panama, if there could be any thing final about it save utter failure, nothing can be known, except that it will be a fabulous amount. A fresh debt of one hundred and twenty millions of dollars has lately been incurred. This loan was offered to subscribers at forty-five per cent. (450 francs for a 1,000-franc bond), but the cost of placing this loan will, it is believed, reduce the amount to thirty-nine per cent.; or to about forty-seven millions for the one hundred and twenty millions. It is believed, with good reason, though the debts of the company are difficult to ascertain, that about one-third of this amount is already owing to contractors and others for work already done. So that without considering interest on its enormous obligations, the company will have but a small portion of this

new loan to apply to work upon the canal. These obligations now amount to a sum little short of three hundred millions of dollars, and with this huge debt staring them in the face, I can say without exaggeration, that the great difficulties and expenses of excavation are all still before them, and the knotty, perhaps impossible, problem of the Chagres River is still unsolved.

Do not, I beg you, permit this showing of the Panama Canal to influence you against *any* canal between the oceans. These facts do not surprise those who have studied the question. Great engineers warned Paris and the world of just such a disaster at the Paris Congress, while they urged Nicaragua upon their attention, as being an entirely feasible, economical engineering project. We know why they were not listened to; we know how the French clustered loyally about their famous de Lesseps; how he, totally ignorant of the topographic and climatic difficulties, flushed with success and impatient of contradiction would hearken to nothing but a French plan, executed by Frenchmen. Do not, therefore, let this influence your minds against a plan and route recognized as practicable for centuries, and already so closely surveyed as to leave no element of doubt as to its engineering qualities, its small cost, and its final value; for such is indeed a temperate description of the route by way of Lake Nicaragua and the River San Juan.

We have now considered the three lines and methods before mentioned, by which the oceans may be connected: Panama, a sea-level canal, Nicaragua, a canal with locks; and Tehuantepec, a ship railway.

By way of the Panama Isthmus a canal with locks could have been constructed. It would have been ex-

pensive; vexatious problems would have presented themselves in supplying water to its summit level. Nevertheless it was a possible, though not attractive, engineering problem.

Attempts have been made, however,—disastrous attempts—to construct a canal at the level of the sea at this isthmus. This project, impossible as an economy, impracticable as an engineering scheme, has, by its failure, made it improbable that a canal of any kind can, during this century, be made successfully at Panama.

The route for a canal with locks through Nicaragua, using the lake as a summit level, presents itself most favorably, both as an engineering and an economical problem; a scheme which, as far as we can judge, seems specially favored by nature.

The line by way of the Isthmus of Tehuantepec, if a canal were possible there, would commend itself to the commercial interests of the United States on account of its northern location, making the transit between our Gulf and Pacific States a most convenient and speedy one. So far as is known this water transit cannot be provided. The ingenious conception of a famous engineer may perhaps have there a practical trial, and an effort may be made to carry loaded ships of the largest size on a railway more than a hundred miles long, and which achieves over six hundred feet of elevation in its passage between the oceans.

The ship-railway project is born of a keen desire to utilize this Isthmus of Tehuantepec for commerce. It does not arise from any manifestation of nature in favor of its use for purposes of a transit route. More than this, the world generally has not asked for a railway, but for water transit—for a canal.

To those, then, who, like myself, are assured of a Nicaragua Canal in the future, it may be of interest to consider it with reference to the United States. We have spoken of its importance to our commerce. Let us now glance at its value from a military and naval standpoint.

From a point of view, strategic and political, it may be said that if this canal were the southern boundary of the United States, our need to hold it would be overwhelming and unquestioned. To permit a feeble race of people with an uncertain government, such as occupy almost all the western hemisphere south of this country, to control a boundary canal, would soon result in the swallowing up of that feeble nation and of the canal control by some European power, strong and aggressive. Such joint possession as happens with a part of the St. Lawrence River, where another great nation owns the other bank, would not be practicable, if it were Nicaragua or Costa Rica confronting us there. Were the Rio Grande a great channel of navigation, connecting our Eastern and Western States, instead of the unimportant stream it really is, we could not permit even our neighbor Mexico to have a part in its control. And what is true in this supposed case is the more so when, in reality, between us and the proposed canal there lie intervening countries, all of them feeble and liable to be easily dominated by an outside power.

There is, in fact, no locality favorable to an interoceanic canal which could be any thing but a passage, a narrow thoroughfare, connecting two of our great divisions, our Atlantic and Pacific States.

Further, we are pledged by our traditions to protect the states of Mexico and Central America from European

aggression. It is plain that we must abandon those traditions if we are not to control a great artificial channel penetrating the very heart of Central America, and passing from sea to sea.

These reasons for our holding the canal would apply in the case of a canal along any practicable route, but much more in the case of one through Nicaragua, for if that route be followed the construction of the canal at once establishes in the lake, in addition to the water transit between the oceans, a grand interior fresh-water harbor within a few hours of either ocean. As a base from which to dominate and control both coasts and the West Indies, the strategic value of such a harbor is beyond estimate. Absolutely sheltered and secure, its fresh water constantly tending to cleanse the ships' bottoms, its lofty islands offering such sanitary opportunities that no tropical sickness need ever prevail, this great lake, with anchorage for the world's fleets, seems to thrust itself upon the attention of intelligent engineers as the only solution of the transit problem; while to the naval officer, who sees in the near future the necessity for the United States to control with its fleets the coasts and the great archipelago to the south of us, this capacious interior basin offers itself as harbor, depot, strategic base, making such control possible and simple.

It seems idle to argue as to whether it be wise or expedient to obtain this domination. Whether right or not, great nations always do control affairs of the feeble and unprotected in their vicinity. Whether we seek it or not, this domination will be forced upon us throughout those regions and seas which lie near us in the South.

Nature has defined the limits of such areas as should,

from duty and policy, be of special interest to us. The Caribbean Sea, Gulf of Mexico, West India Islands, the shores, east and west, of Mexico and Central America, and the Spanish main,—these must be cared for by fleets in peace, and fought for by fleets in war. Beyond this our influence and interest, physically and geographically speaking, need not extend. Except its north shore, South America is quite removed from us and our interest. Pernambuco and Rio de Janeiro are nearer to Spain and Portugal than to New York and Pennsylvania in actual distance, as well as in language and sentiment. We need not dwell upon this question. A careful inspection of the map of the western hemisphere forces the conclusion upon us that a nation occupying the present position of the United States must, if it lays claim to greatness, be dominant in the Caribbean, the Gulf of Mexico, and the neighboring islands and shores. These are the passage ways, if not, some day, the ultimate destinations, of the richest products of our industry, floated southward from our great central region, and passing through Mobile, New Orleans, and Galveston to the sea. Duty and interest, then, seem to demand that we prepare for this control in the future. It is more than a consequent of greatness, it is greatness itself; it is part of the definition—we cannot be a nation of the first rank while lacking the control of the seas and coasts immediately south of us.

From a naval and military point of view, therefore, the direct advantage of holding such a great base of operations as Lake Nicaragua is immense—is, perhaps, when we consider all the circumstances, without parallel in history. If we consider the unhealthiness of the harbors,

coasts, and navigable rivers of the Caribbean region, and, on the other hand, the comparative immunity from disease to be enjoyed by a fleet occupying the elevated waters of this fresh-water lake, with hill slopes on its islands reaching far above the yellow-fever line; if we note the rapid destruction of iron ships' hulls in sea-water, the alarming fouling of barnacles and grass, and consequent serious decrease of speed, frequently reducing a fourteen-knot steamer to eight knots; and if we then reflect upon the quick remedy which fresh water always affords in this difficulty; if we consider the admirable strategic position of the lake, and regard its size and depth—so great as to permit the largest fleet to drill itself to the highest evolutionary efficiency;—these and numerous minor details, if well considered, will not fail to convince us of the value of this great possible depot and station.

A well-appointed dockyard would be established on the shores of the lake, or on its lofty island of Ometepec. Hospital sites and camping-grounds for the crews of vessels would be selected close to the fleet's anchorage, but well above the fever line, on the mountain slope, in a bracing and healthy air. Store-houses and hulks, coal piles and elevators, would give facilities for the rapid coaling and provisioning of the fleet. Stone dry-docks alongshore, and floating docks sent from the United States in sections to be put together on the lake, would offer opportunities for the quick repairs of damages sustained in battle. Telegraph cables would connect the station with Washington, and railways through Mexico, always available in peace, would be easily made so in any war against European powers. It is well to note here, as an important

item, that such a government establishment, always kept ready for a war, would not, during the long intervals of peace, be expensive. The nautical needs of the merchant marine are so nearly those of men-of-war, that a dockyard of the first class, with all its repair shops and provisioning facilities, could be kept fully employed and in a high state of efficiency during a peace, however long; and this at no expense, no running expense, to the government, but, on the contrary, at a handsome annual profit.

Here, then, in this secure, capacious, and healthy retreat, within a few hours of the open ocean, let us see what would be the capacity for reaching out possessed by a fleet in this stronghold. If the speed of a fleet be fifteen knots, it can in two and one half days, from the canal entrance, reach the Yucatan Channel, south coast of Cuba, Windward Passage, Jamaica, and as far east as Maracaibo on the Spanish main. In five days it may be off the mouths of the Mississippi and Rio Grande, in the Florida Strait or among the Bahamas, in the Mona Passage or at Martinique and Barbadoes, and include in its reach to the eastward the whole of the Spanish main.

On the Pacific side, in five days, at full speed from the entrance of the canal, the fleet can arrive in the mouth of the Gulf of California in one direction, or upon the coast of Peru in another.

It will thus be seen how long would be the arm, how effective the power of a swift and well-conditioned fleet, ready to act on either coast, and drawing constant strength and nourishment from this admirable lake base. With a strong naval force in Hampton Roads, another in California, ready to move effectively at a moment's notice, then a similar fleet in Lake Nicaragua would complete

what may be called the naval strategic defence of our nation. There would be many additional details in any complete scheme of defence. Key West must be held, and the mouths of the Mississippi protected; a strong force, auxiliary to the Hampton Roads fleet, must hold the sounds and channels of Long Island and Nantucket; Puget Sound must be held, and the Gulf of California dominated.

The three great divisions of our fleet, to protect our coasts and our vital interests to the southward, must, however, hold positions similar to those above mentioned, in a large and well-considered scheme of strategy.

It would be possible for the Lake Nicaragua force to join the Hampton Roads fleet and engage an enemy's off Havana, and thence, allowing two days for coals and provisions in the lake, it could join the California fleet off Cape St. Lucas, and fight an enemy in the Gulf of California, and this within twelve days of the first battle.

These possible movements and combinations need not be dwelt upon; one such example as the above is sufficient to indicate the value of such a naval base as Lake Nicaragua and its many strategic combinations.

I may now be permitted to assert that the route for a canal by way of Lake Nicaragua and the river San Juan, when viewed commercially, is far superior to any other means of connecting the two oceans at present known, but that added to its advantages, financial and engineering, it has, when viewed in a naval and military aspect, an eminent fitness which is at once apparent.

Let me ask your forbearance for a few moments longer, while I quote some sentences from a remarkable pamphlet written in 1846 by Louis Napoleon, afterwards Emperor of the French. It is as follows:

"The geographical position of Constantinople is such as rendered her the queen of the ancient world. Occupying as she does the central point between Europe, Asia, and Africa, she could become the *entrepôt* of the commerce of all these countries and obtain over them an immense preponderance; for in politics as in strategy, a central position always commands the circumference. This is what the proud city of Constantine could be, and this is what she is not, because as Montesquieu says, 'God permitted that Turks should exist on earth, a people most fit to possess uselessly a great empire.' There exists in the New World a state as admirably situated as Constantinople, and we must say up to this time as uselessly occupied. We allude to the state of Nicaragua. As Constantinople is the centre of the ancient world, so is the town of Leon the centre of the new, and if the tongue of land which separates its two lakes from the Pacific Ocean were cut through, she would command by virtue of her central position the entire coast of North and South America.

"The State of Nicaragua can become, better than Constantinople, the necessary route of the great commerce of the world, and is destined to attain an *extraordinary degree of prosperity and grandeur.*

"France, England, and Holland have a great commercial interest in the establishment of a communication between the two oceans, but England has more than the other powers a political interest in the execution of this project. England will see with pleasure Central America becoming a powerful and flourishing state, which will establish a balance of power by creating in Spanish America a new centre of active enterprise, powerful enough to give

rise to a great feeling of *nationality*, and to prevent, by backing Mexico, *any further encroachments from the North.*"

These utterances of a man of thought, this evident fear of the Eagle in the North, are significant. To this student of large enterprises, the pre-eminence of Lake Nicaragua, politically and commercially was quite plain, forty years ago. He could not think that the eyes of this eagle would lack the proverbial keenness of vision, that the great Republic would have that political control pressed upon it, that commercial power freely offered to its citizens—all of it only to be rejected with cold indifference.

What is it we are doing, my friends, in rejecting this control? Are we blind to the strides the Germans are making toward commercial supremacy in Mexico and Central America? Is there no significance in the loans which English capitalists are freely offering to Nicaragua to improve the navigation of her river and lake? These things tend but one way. The English merchant, the German chancellor, the French engineer—they know what these things mean, they know what their nations need for their development. It is only we that do not know. It means *Empire*, ladies and gentlemen—the control or possession of this canal means *Empire*. It is to our wealth, our development, our supremacy as a nation among nations, what India, and more than India, was to English merchants, and to the English crown and nation. It means the guiding of the great Pacific's wealth into New York rather than Liverpool, into New Orleans instead of Marseilles. And we,—we also will learn this some day, when alas! some other nation has seized the golden key as it drops from our listless hand and with it unlocked for itself the door to wealth, fame, and power;

when another nation has built and holds the Nicaragua canal; then will we learn and know, and *then*, the hand that dropped the key must grasp the sword in its place and so win back the key—and again will precious blood and treasure be wasted in long wars to regain that which with slightest effort and to our great profit we might now peacefully retain.

Surely our commercial public should be anxious to secure for themselves the building of this canal in the interests of trade. Surely our national government should be quite as urgent to hold a controlling interest in it, as a pillar of strength in peace and in war.

Nicaragua has cordially offered to our government canal rights of inestimable importance. It is not for us to know what wise reasons caused our government to decline this offer. Nicaragua has now and for years offered to certain of our citizens a liberal concession for the construction of a canal. These citizens are to-day unable to accept this offer, though anxious to do so, because the fatal apathy of our capitalists and merchants denies to this project the assurance of financial support. So blind are they to the immense profits accruing from this project, both to themselves and to the country, and yet so keen to see smaller gains in smaller and less secure enterprises, that we are driven to believe at last the old story of the man who saw with ease the flies on the barn door, but could not discern the door itself.

Fortunately, light is now dawning, and there is good reason to expect that the next few months will see American citizens of wealth and reputation entering upon this great project, and identifying themselves with this, the greatest of peaceful achievements known to our century.

Let us hope that it will come by peaceful means, that in this instance "grim-visaged war" will not enter into the problem, but that the great canal may draw nations closer together in the bonds of peaceful trade and of enlightening commerce. Let us think of it as doing for us what we so sorely need, building up for us a vast coastwise traffic of sea-going ships between our Atlantic and Pacific coasts, leading surely to a new birth of that great American shipping which died in our civil war. Let us, looking hopefully into the future, see the canal bringing nearer to us the brave republic of Chili and its neighbors, see it binding Australia and New Zealand to England, Manilla and the Philippines to Spain, see it, in fact, bringing the whole Pacific close to our doors and to Europe, and making most true and forcible the old motto of ocean commerce, that

> "The seas but join together
> The nations they divide."

Tehuantepec Ship Railway (proposed)—
Length, 134 miles.
Probable cost of construction, $100,000,000.
Probable receipts (gross) $12,500,000 ; (net) $4,000,000.

Nicaragua Canal (proposed)—
Length (canal) 40 miles ; (river and lake) 130 miles.
Locks, 7.
Floor of canal, 80–120 feet wide.
Surface of canal, 80–300 feet wide.
Depth, 28 feet.
Probable cost of construction, $75,000,000.
Probable receipts (gross), $12,500,000 ; (net) $12,000,000.

SUEZ CANAL (completed)—

Length, 99.9 miles.
No locks—à niveau.
Floor of canal, 72 feet wide ; surface, 190-328 feet wide.
Depth, 25 feet.
Tonnage using the canal in 1883, 5,775,861 tons.
Receipts from tolls during 1883, $13,702,413.
Cost of construction, $93,000,000.

PANAMA CANAL (constructing)—

Length, 46 miles.
No locks—à niveau.
Floor of canal, 72 feet wide ; surface, 100-164 feet wide.
Depth, 28 feet.
Probable tonnage, if canal is completed, 5,000,000 tons.
Probable receipts, " " $12,500,000.
Probable cost of construction, $500,000,000.

SAVING IN DISTANCE AND TIME BY NICARAGUA CANAL :

	Miles.	Gain for Sailing Ship—Days.	Gain for Freight Steamer—Days.
New York to Hong-Kong . .	2,450	27	12
" Yokohama . .	4,200	40	21
" Callao . . .	4,390	52	22
" Honolulu . . .	7,100	67	35
" San Francisco . .	7,370	72	37

NOTE.—The following-named persons, desiring to organize a company for the purpose of constructing the Nicaragua Canal, have recently applied to the United States Congress for a simple act of incorporation : Frederick Billings, Charles P. Daly, Francis A. Stout, Horace L. Hotchkiss, Wm. L. Merry, Edward F. Beall, W. B. Franklin, Sheppard Homans, Daniel Ammen, Jas. H. McMullan. Additional information on the subject of the proposed enterprise will be gladly furnished by any of these gentlemen.